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Response to Reviewers: I have updated the manuscript removing the initial sections and referencing the original DRS paper. I have reframed the contribution in the abstract and highlights. I've also updated figure 1 and included a new image (now figure 2).

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Temporal Design: rethinking time in design

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Abstract

From critiques of acceleration, to efforts to frame present actions within more extended futures, designers have been increasingly concerned with how perceptions of time influence practices and how these perceptions can be influenced by design. In this paper, we argue that perspectives of time in design are highly influenced by dominant narratives that describe time as uniform, external to practices, and in a state of continuous acceleration. We propose Temporal Design as a shift from pace, direction, and subjective experience towards looking at time as emerging out of relations between cultural, social, economic and political forces. We argue that this pluralist perspective helps to demystify problematic experiences, potentially enabling more inclusive ways of understanding time.

Keywords

design research; philosophy of design; design theory; interaction design

***Research Highlights**

- Time in design is regarded largely in terms of duration, pace and direction
- Temporal Design proposes a shift to a pluralist and politicised perspective on time
- It regards time as emerging from material, social, economic and political forces
- Temporal Design can enable more inclusive ways of understanding time

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In this paper we contribute to work focused on identifying ways in which design could help to promote more positive ways of approaching time. Nowadays, this focus is often spurred by a perceived condition of universalised acceleration and an interest in inspiring actions that could lead to more desirable outcomes in the future. A critique of acceleration, and consequent questioning of design's traditional support for productivity, efficiency and time-saving, is commonly proposed by projects within the *Slow Design* (Strauss & Fuad-Luke, 2009) and *Slow Technology* (Hallnas & Redstrom, 2001) movements. Many of these projects, however, often reduce the original proposal of temporal diversification to a dichotomy between fast and slow (as discussed in Pschetz et al 2016). Anticipation of future conditions can be identified in numerous speculative design movements such as *Critical Design* (Dunne & Raby, 2001), *Design for Debate* (Dunne & Raby, 2007; Kerridge, 2009) and *Design Fictions* (Bleecker, 2009; Sterling, 2011). The focus on the future, however, can limit exploration of temporal expressions in the present (Pschetz et al 2016). Critical scholarship on the role of time in social life can help support arguments and interventions that question norms of time and expand possibilities for design.

In this paper, we aim to expand current understandings by inviting designers to look beyond fast and slow design (time as pace) or narratives of past, present, and futures (time as direction). In Western industrialised societies, there is a strong tendency to regard time as universalised, external to human practices, and an individual concern. As discussed below, attempts to counteract this tendency often draw attention to time as subjective experience and flow. However, here we argue for a broader temporal form of design that would consider time, not as subjective or objective, but in terms of what anthropologists and sociologists have called social time. This allows a more specific focus on issues of ethics, equality, power, and social management and coordination. We therefore propose Temporal Design as a way to bring the cultural, social and economic aspects of time to the surface by investigating how they shape the social coordination of particular groups. By revealing this complexity, Temporal Design would open up space to discuss these relationships, allowing for more inclusive temporal organisations to emerge.

1. Coordination in design as time management and efficiency

In this paper we argue for a shift in the way designers generally understand time, moving away from pace and direction towards its underexplored role in social coordination. However, given the attention dedicated to time management, scheduling, task tracking, and efficiency within design we want to first discuss this approach to coordination before going on to discuss our own. That is, one might argue that coordination has been explored by designers through systems that allow activities to be organised asynchronously or which were developed to keep track of schedules. After all, calendars can nowadays be synchronised across devices and across groups (with Google Calendar being highly popular) and clocks are designed with ever more sophisticated characteristics. For example, Quietto (Lee et al. 2017) allows people to keep track of their agenda and give an overview of appointments using a tactile and interactive interface. Holi.io's Bonjour (2016) provides an A.I. personal assistant to give advice on weather and traffic conditions. Services such as Doodle (doodle.com) and Meet-o-matic (meetomatic.com) facilitate setting appointments by allowing participants in a poll to independently provide dates and times in which they are available. Further group activities are facilitated by systems that support buying gifts (shareagift.com), coordinating sales information to allow quicker and more

effective responses to clients (capsulecrm.com), or tailoring communication to a particular group (e.g trello.com, slack.com, etc).

These systems tend to facilitate individual activities in order to maximise efficiency and speed. In this way, they tend to follow dominant narratives of acceleration rather than support reflection on what kind of temporal organisation is most needed for groups involved in various activities. In some respects, people's interaction with these systems is carefully taken into account, but the way coordination is facilitated follows the mantra of time saving, which is often integrated within a cult of new technologies. Similar observations are made by Taylor et al (2017), who reflect on the way new technologies tend to promote values of planning, scheduling and efficiency, which are particularly problematic when designing for cultures that do not hold these values. By allowing asynchronous coordination of activities, these services even reduce the number of interpersonal interactions and hinder social strategies of excusing, persuading and negotiating times (Pschetz 2014). Providing more nuanced ways of discussing priorities, which would help to identify what is important for the group, is seen as neither necessary nor desirable in the design of many work management tools. The attachment to such tools hinders temporal conception outside clock time, and therefore exploration of other forms of time, which may cause issues when an opening up of perspectives is required. Mirmalek (2009) has skilfully shown these issues in her analysis of the Mars Rover team's attempts to utilise an extra terrestrial version of clock-time, while working across interplanetary time zones on Earth and Mars.

The inattention to social aspects of coordinating, negotiating and managing work times can be seen in proposals that even go so far as to suggest complete elimination of human interaction. Kairoscope (Martin & Holtzman 2011) adjusts appointments automatically according to contextual information. It has the ability to change appointments in order to minimise gaps in a schedule, allowing, for instance, for a 30-minute cancelled meeting to automatically ''bump up'' the following meeting if ''impacts are minimal'' (p.1970). The system also learns if a meeting regularly takes longer than scheduled and adjusts appointments accordingly. Similar approaches have been taken by previous projects such as Fluidtime (2002). We would argue that the use of algorithms for temporal adaptation, while seemingly impressive, is problematic as they reify time as an objective flow outside of human influence, while still creating as many, or more, constraints as traditional calendars and clocks. Similar to asynchronous tools for time management, they inhibit traditional person-to-person means of handling appointments, thus excluding the use of people's improvised temporal strategies, and broader considerations of the ethics and politics of time-use. Temporal improvisation may generally appear to be a hindrance to productivity, but they are important mechanisms for negotiating between the different and often unequal temporal perspectives of particular groups. Attempting to replace these strategies with computational ones would reduce the possibilities available for resisting dominant perspectives of time and for considering wider social issues related to time.

2. Developing a broader approach to time

Despite the key role that different design movements have had in opening up approaches to time within design, we argue that they have nevertheless been constrained by dominant Western narratives about the nature and value of time. That

is, the focus has been on time in terms of duration (short-term or long-term), pace (fast or slow), direction (past-present and contesting futures) or as a container for other activities (issues of productivity). Our interest, however, is in calling attention to the complex negotiations around time that occur in social life; where time is treated in terms of social management, legitimacy, status and accounts of agency (as explained by Greenhouse, 1996). As mentioned, time is often presented as a single flow, one that is accelerating based on the development of new technologies. It is still often considered to be neutral, objective and external to human practices, instead of socially shaped and produced. One consequence of this approach, as we saw in relation to time management, is that problematic experiences of time are viewed as an individual concern, something that needs to be coped with on an individual basis.

Often, the way into thinking about time in design in more complex and less linear ways involves a turn to philosophy. Whether the influence comes from Heidegger, Bergson, Deleuze, Benjamin or elsewhere, much of continental thought provides important ways of challenging the dominance of linear time and tuning into the non-linearity of subjective time and historical time. However, we would argue that within these theoretical paradigms too there is a problematic focus on the individual (in the overarching interest in the subjective experience of time) and a narrow cultural context (in the neglect of non-western approaches to time and history). Further, the artefacts used to tell time, such as clocks, are largely understood by these philosophers as being outside of their phenomenological remit and are uncritically understood as straightforwardly signalling an 'objective' or 'universal' time (Bastian 2017).

Thus in developing a theoretical framework which could support the complex understanding of time that we allude to above - an understanding of time as multiple, heterogeneous and arising from the unequal entanglements between various social formations - we would argue that work in the social sciences, particularly anthropology and sociology, represents an underutilised resource. This work enables us to rethink the opportunities available to designers to contest and reshape narratives of time by allowing us to ask different questions about what time is and how it works. For example, rather than seeing time as a flow between past, present and future (whether this be linear or nonlinear), it becomes possible to ask how time operates as a system for social collaboration (Sorokin and Merton 1937), how it legitimates some and 'manages' others (Greenhouse 1996), or how it works to support systems of exclusion (Fabian 1983). We thus move from time as flow to time as social coordination.

In particular, we are inspired by what Huebener (2015) has called 'critical time studies'. This approach addresses time, not so much in terms of speed, pace and tempo, but in terms of the webs of unequal relationships within which these speeds, paces and tempos operate, and through which experiences of time are produced. Latour's (2005) paper *Trains of Thought: The fifth dimension of time and its fabrication* offers one way of setting out this approach more clearly. In it he claims that the traditional dichotomy between objective and subjective time fundamentally misrecognises the way that our experiences of time are a "*consequence of the ways in which bodies relate to one another*" (emphasis in original 2005, p. 176). Using an extended metaphor of twins travelling through space, one by train and another by cutting a path through a forest, he suggests that our experience of time is not about the mind's perception (subjective) or the universe's form (objective), but a "question of the obedience and disobedience of humans or nonhumans" (2005, p. 178). For the twin on the (Swiss) train, the work of engineers, scientists, train companies, etc., creates a smooth experience unimpeded by any 'disobedient' actors. As a result, the train trip is experienced as taking place in a uniform and abstract time. For the

second twin however, “each centimeter has been won over through a complicated negotiation with other entities branches, snakes, sticks that were going in other directions and had other ends and goals” (2005, p. 175). Here time is multiple, conflicting and inherently requires compromise and adjustment.

While Latour’s account has primarily been taken up within mobility studies, he offers designers a way of thinking through the ethics and politics of time that emphasises relationality and provides a perspective on materiality that is different to, for example, slow technologies’ mindful engagement. As he writes of the train-traveller and their straightforward experience of time, “one can be allowed to forget for a moment that smooth displacement in time and space is paid for somewhere else by other people, but not forever” (p. 185). We are encouraged to ask not only how one might engage with the material world differently, but also how one’s own experience might be bound up with the experiences of others. Again, this approach to time is very different to the influential work of continental philosophers. Rather than the virtuality of Deleuze and Guattari, or the *durée* of Bergson, we can instead see the way time operates, as Sharma argues, as: “a form of social power, a relation of difference and a material struggle” (2011, p. 440). Her work in particular makes vivid the ways that some experiences of time are paid for by others’ time. For example, she argues that the key issue in contemporary temporal politics is not a universal speed-up or acceleration, but rather the individualised and depoliticised expectation that all ‘good’ people will find ways to recalibrate.

That one’s experience of time might be supported by or even ‘paid for’ by another’s (whether that is an individual or a group) resonates with a number of the concerns we raised above, and indeed invites designers to ask pressing questions of the solutions offered to problems of speed-up, techno-futurism, or group coordination. For example, who loses out when time management tools attempt to sustain coordination, not through negotiations between social actors, but through an autonomous algorithm? How much is the experience of speed linked to social position and status, rather than to an objective fact about the world? What about the social positions that enforce an unwelcome experience of slowness? Does understanding time as linear and all-encompassing support the cultural dominance of the West at the expense of other ways of living and experiencing? For designers interested in intervening in problematic experiences of time, such questions must be brought to the forefront.

3. Temporal Design

To summarise the discussion above, we argue that dominant narratives of time have limited design possibilities by:

- Flattening rhythms and temporal expressions
- Simplifying temporality into dichotomies of fast and slow
- Simplifying the present as uniform and time as a linear progression towards the future
- Locating temporality within artefacts and systems
- Helping to promote hierarchies of time

With this in mind we propose an approach to time in design called Temporal Design as a shift towards a pluralist and politicised perspective on time. Temporal Design attempts to identify and challenge expressions of dominant narratives of time, recognising that everyday rhythms are composed of multiple and sometimes conflicting temporalities, which are shaped by both direct and indirect factors. The approach seeks to empower alternative temporalities that are neglected by these narratives, and suggests that designers start looking at time as something that

emerges out of the complex relations between material, cultural, social, economic and political forces.

Temporal designers would therefore observe time in the social context, investigating beyond narratives of universal time and linear progression, and beyond dichotomies such as fast and slow. This is not to simply negate dominant notions but to acknowledge that they co-exist with other expressions in all aspects of life. There is a multiplicity of temporalities latent in the world. Designers can help to create artefacts and systems that disclose this variety, also revealing the intricacies of temporal relationships and negotiations that take place across individuals, groups, and institutions. This would also help to reveal a network that accommodates the multiplicity of temporalities in the everyday, in the natural world, and in intersections between these realms.

The process of Temporal Design would therefore involve:
· Identifying dominant narratives, including the forces and infrastructures that sustain them or which they help to support;
· Challenging these narratives, e.g. by revealing more nuanced expressions of time;
· Drawing attention to alternative temporalities, their dynamics and significance;
· Exposing networks of temporalities, so as to illustrate multiplicity and variety.

Its contributions include:
· Challenging narrow views of time such as assumptions that time is always speeding up, e.g. by considering situated temporalities and acknowledging that slow and fast rhythms co-occur and are often interdependent;
· Challenging temporal inequalities, by acknowledging that the times of some are more invested in than others, and promoting temporal empathy;
· Broadening out understandings of time to reflect social and political spheres, and our place within more-than-human worlds, thus acknowledging multiple rhythms, and challenging assumptions that nature provides a stable background for human-made 'progress' (McKibben, 2008).

4. Temporal Design interventions

As part of our inquiry into a temporal form of design Pschetz, together with Bastian and Chris Speed developed three design interventions. Two of them, the TimeBots and the Printer Clock, described in the following subsection, aimed at revealing multiple and more nuanced perspectives of time, so as to expand temporal understanding. The third, Family Clock, which is described further on, highlights the interdependence of time on others by exploring social pressures and tensions behind schedules, particularly in the context of the home.

Figure 1 Artefacts designed to explore Temporal Design concepts: Printer Clock (left), TimeBots (centre), and Family Clock (right).

4.1 Revealing the multiplicity of time

The two interventions that aimed to reveal multiple perspectives of time were carried out with 4th grade students (9-10 years) of two primary schools in the UK. Since the advent of mass public schooling, the school environment has been understood to be central to teaching forms of strict temporal discipline that are then utilised in society more widely. However, these interventions showed that even in this context multiple perspectives co-exist. Although students' times are synchronised through timetables and terms, the school still preserves, through each individual (and the wider social groupings they are a part of), contextual aspects that relate to routines, backgrounds and histories that characterise each group. While the aim of both interventions was to explore time in its multiple aspects, they approached it from different perspectives. The Printer Clock focused on social, embodied time, while the TimeBots focused on multiple experiences of speed.

Printer Clock

The Printer Clock emphasised the embodied and situated nature of time, and attempted to promote what we call 'temporal empathy' in the classroom by presenting clock time in terms of the activities carried out by the students. The students initially received kits containing a small clock and a disposable camera, and were invited to use this material to document their routines over a period of 2-5 days (Figure 2). Importantly, the clock was featured somewhere in each photograph, which later allowed us to identify when the photos were taken and to use these photos to signal the time. Approximately 400 images were collected in each school. These images were time-stamped, and used to build up the database of events upon which the Printer Clock would draw.

Figure 2 Students documenting their routines over a period of 2-5 days.

Figure 3 Printer Clock intervention: building the timeline (left), trying the clock (centre) and final one-to-one interviews (right).

The Printer Clock resembled a grandfather clock, composed of a regular clock face (initially obscured), a cord substituting for the pendulum, a printer, and a computer

that stored pictures of activities carried out by the students. Pulling the cord activated the computer, which lit up the clock face and printed a picture that was taken at that particular time in the past. When looking at a clock, individuals often think about their own actions and what they need to do next. With the Printer Clock, the fragmented experiences of others in the past are presented as time-readings, inviting children to connect their own present with someone else's past. Moving from a quantitative to a qualitative time, the Printer Clock tells time through the activities of others and the variety of pictures reveals different activities that come together to make moments in time.

The Printer Clock was placed in the main hall of each school. Students would run over to the clock and keep pulling the cord to see who and what would appear in the next picture. The clock was rapidly taken over by some students, who eagerly looked inside the clock to catch the first glimpse of the printed image, shouting the name of the child in the picture once they could be recognised. Others observed the clock from afar. The clock-face was ignored by the ones in control, with the pictures that carried the time effectively replacing it. The peak moment of excitement was when children were faced with their own pictures.

Participants were also asked to choose a time to be printed, and in this case they mostly made this choice based on an activity that they particularly enjoyed, often referring to time indexically via the activity before translating it into clock-time: “probably when I’m doing karate, that would be around half past twelve” (D1). The second most frequent strategy was to pick a regular appointment in their schedules; such as the time they left home to go to school. Another strategy was based on a combination of numbers, e.g. 03:09 to represent the 3rd of September, or on a lucky number. These strategies show the richness of associations prompted by clock-time. Activities, tasks, schedules, quantities and numbers were all expressed in the children’s choices. The children could then compare their expectations of what usually happen to them around that time, with what others had captured in their photos.

Overall the children looked for identification in the printed images. There was a sense of satisfaction when the printed picture met this expectation, and a converse attitude of disdain, sometimes preceded by surprise, when this expectation was not met - e.g. expressed by not wanting to keep or talk about the image. The search for familiarity was achieved in a few cases, but in most cases participants were faced with activities of fellow students with whom they were not so familiar, or activities that they would not notice, as these activities did not directly appeal to them. They were taken out of their comfort zone, and it is in this dislocation that a shift from a sense of an individual time (which was uncritically mapped onto universal time), to unexpected networks of times takes place.

The documentation of routines invited the students to reflect on the multiplicity of practices that shape temporality of those belonging to the school community, making the social layering of time more perceptible. Far from being restricted to timetables, buzzers and timed tasks, school time is a fusion of personal times, rhythms and temporal forces (Adam 1995). As clock-time gains more importance in the students’ lives, this kind of activity encourages them to consider alternative, non-quantifiable notions of time as part of their temporal contexts.

TimeBots

While the Printer Clock pointed to the mesh of activities and characters that come together to create time, the TimeBots drew attention to personal rhythms and how

they were perceived in the context of the classroom. The aim was to challenge the idea that the world is in a state of constant acceleration by inviting children to reflect on the multiple speeds of their day. In contrast to the slow movement, which assumes acceleration as a universalised condition and attempts to counteract this condition by promoting opportunities to slow down, the intention was to invite students to explore the variant speeds at which they lived their lives.

The TimeBots consisted of small 3-wheeled robots that could be programmed with the help of tokens to run as slow, medium or fast in a 5-step sequence, representing feelings about speed in 5 periods of the day. The intervention started with a series of 'warming up' questions about how the students felt about speed, describing activities, people, places and objects considered as slow, medium and fast, marking them on a form. They were then asked to focus on a regular weekday and to describe their feelings of acceleration in five periods, marking their thoughts on another dedicated form. After this reflection, the TimeBots were distributed and decorated to create a sense of personal identification, and each child recorded their feelings of speed upon their bots. The bots were then finally released altogether into a pen, running over the 5 speeds in a continuous loop, so as to enact the collective rhythm of the classroom.

Reported experiences of speed, even of seemingly similar situations, varied greatly among participants. Similar activities, places, people and objects were considered as fast, medium and slow, or all at once, depending on the situation and the people involved, the mood of participants, time of day, etc. Further, activities and places that might intuitively be associated with speed were sometimes considered slow (e.g. athletics, the high street, etc.). Particular senses of speed were not intrinsically related to specific activities, people, places and objects, but were constructed by each participant based on their own personal experiences. It was, however, still possible to identify some bias towards interpreting experiences through dominant narratives of time, particularly in the "activities" topic, where slowness was frequently associated with displeasure and boredom, while acceleration was associated with pleasure and enjoyment. In the case of people, however, slowness was not only associated with inefficiency "[he is slow] because he kind of can't really bother getting to work to get paid and he lives at home and doesn't pay the bills" (R2), but also with pleasure "my grandma... I like that she is slow" (A2), and tranquillity "because C3 is really peaceful she never shouts or anything" (S2). Busyness was associated with both acceleration and slowness.

In the forms where participants marked how they felt about their days, the three speeds were relatively well represented in all five periods. In the final performance where the bots were released within a pen, the speeds programmed into the TimeBots were admittedly too personal and subjective for others to connect them to their owners, and the owner of each robot was mostly recognised by its decoration. The children could however observe the representation of their own rhythms and the variety of rhythms within the classroom. The TimeBots interacted with each other on a different level, revealing the subjective timescape of the group, and enabling a unique glimpse into the combined subjective experiences of time of those students.

Figure 4 TimeBots: decoration and final performance.

The variety of speeds pointed to the richness of temporal experiences within the group. While the repetition of dominant narratives of speed demonstrates the difficulty of breaking with a pervasive culture of time, overall the children did not experience their 21st century lives solely as accelerated. The recognition of this multiplicity challenges the assumption that social life is monopolised by a single temporal expression, and the association of slowness with familiarity and tranquillity challenges the idealisation of always doing more. Acceleration might have become a normative model embedded in our language, but speed is experienced in multiple variations.

4.2 Revealing tensions and negotiations of time

The third intervention, the Family Clock, was situated in the context of the home as a reflection on the way schedules are interwoven within families. It investigated tensions, hierarchies and power relations, and the strategies that family members create to negotiate, agree or contest common rhythms. It also presented a critique of the notion of flexitime, which is often presented as a solution to work/life imbalances in the context of new technological developments. The intervention was based on a physical clock designed so that the face represented the length of a day and, rather than isochronic hours, it indicated the various appointments of each member of a specific family. The clock was accompanied by a dedicated smartphone/tablet application that could be used by family members to set the clock back or forward according to individual constraints and desired pace of life. For example, if a child was hungry they could move up dinner time. The changes each individual made were recorded in a database, transmitted to the clock, and synchronised on all devices of the family. The two hands of the Family Clock indicated, not hours and minutes, but time in intervals of 5 min (short hand) and speed (long hand). The long hand regularly moved at the speed of one tick per second, but would accelerate or decelerate according to how often family members changed time. If an appointment was brought forward (e.g. moving dinner from 6pm to 5pm), the long hand moved faster (to reach the desired appointment more quickly), and if set back (e.g. moving the trip to school from 9am to 10am) it would move slower (to take longer to reach the appointment), eventually catching up with standard clock time. The clock was hosted by three families (the Clarkes, the Millers and the Wilsons) for a period of 1-3 weeks, where they were asked to interact with it in different situations, followed by interviews.

Perceptions of the Family Clock differed significantly across the families. While the Clarkes emphasised the way it seemed to connect them more closely, the Millers considered it particularly disruptive and the Wilsons were concerned about its apparent lack of function. Within each family, however, the responses showed a coherence of perceptions, which illustrates how these perceptions are rehearsed and learned in the everyday. This echoes Sorokin and Merton's (1937) claim, that time is

best understood as a system of coordination, but also Latour's point that time is produced through our negotiations with others.

Issues of efficiency appeared in all interviews. Most of the participants reported feeling "stuck" when asked when they would use the clock to influence someone to do something later. Feeling a sense of time-pressure was described as a constraint, as an issue of contempt, a reason for pride, or simple resignation, depending on how in control participants felt. Time was thus bound up with notions of control and morality. While Charlie W (13 years old) would set the clock back to give himself more time to complete tasks and thus appear more efficient, he still felt that changing time was somehow unethical: "because I have to be mature about school and not immature speeding up time to get through the lesson, but mature to get to learn something." Here then we see time linking up with senses of what it means to be (or appear to be) successful within a particular social group. Structured time and discipline were also often associated with success. Ethan M (35-45) considered that more flexible school structures would fail to engage students, and Paula M (35-45) thought she wouldn't get things done if she had a more flexible work schedule. A sense of comfort provided by schedules was also pointed out by participants, as with schedules "you sort of know you are meant to be there at that time, you don't have to decide to be there at that time, you just are there at that time, so it is easy thinking" (Charlie W, 13).

Figure 5 Family Clock prototype and implementation

In these ways the clock highlighted attitudes to dominant temporal narratives, however it also playfully encouraged participants to subvert them. Lily M (7) proposed changing time constantly so that she didn't have to go to school, and her and her sister Alice M (10) suggested using it to make their parents go to bed sooner, so that they could watch TV until late. Changing parental schedules was also a strategy for investing more resources in supporting the children's time. Rob C (12) and Emily C (16) suggested putting the clock forward so that they would miss the bus, and their mum would have to give them a lift to school. When asked about when they might use the clock to create a "funny" situation, however, Emily admitted, "it was quite hard to think of ones which weren't a bit cruel". In each of these examples, time becomes much more than a sense of flow, and instead we see how it can be used to 'manage' others, in ways that can be empowering for some and detrimental to others.

The intervention encouraged participants to consider how their times relate to the times of others, but most importantly it allowed them to reflect on what it might mean to challenge the dominant account of time as external and objective and instead see it open to transformation. Sally C explained the clock as a "sort of a more imaginative thing, that helped you imagine what it would be like if you could change time" and

Emily C described it as something that “made you think about time.” That is, “I liked thinking about it. Normally you wouldn’t think about when you would like to speed up time and when you would like to go back to what was good. It made me think about the day, what happened, and what you would like to change” (Emily C). Even so, others felt little agency in relation to changing the ways that time works, accepting it as “how the world is nowadays” (Tom W, 45-55).

5 Discussion and closing reflections

As discussed above, designers are increasingly interested in investigating problematic temporal experiences that are thought to compromise quality of life in Western industrialised societies. These experiences can often be related to dominant accounts that describe time as objective, universalised, attached to technological developments and increasingly accelerated. A number of design movements have attempted to look at alternative approaches, but their developments have often been appropriated and simplified, sometimes reinforcing the very narrative that they attempted to criticise. By assuming that acceleration is a universalised condition, and designing for people to either cope or counteract this condition, designers reinforce dominant narratives, and the multiple temporal expressions manifested in everyday life are not clearly articulated.

Temporal Design attempts to counteract these effects by drawing attention to social practices of time. The three interventions designed during our inquiry process indicate that these practices influence perception and come together to create situated notions of time. While the TimeBots and Printer Clock revealed multiple ways of interpreting time that challenge assumptions regarding the dominance of particular expressions, the Family Clock indicated that temporal perceptions are constructed by routinely referencing activities through socially constructed values that nevertheless still often refer to dominant narratives. In the Family Clock intervention, the interpretation of time as a cohesive unity prevented participants from questioning hegemonic paradigms, even if they were perceived as problematic. Instead, participants looked for personal ways to adapt or find justifications for these conflicting issues, or as Sharma describes it, to recalibrate. Above all, however, the intervention provided evidence that time is not neutral. It expresses social hierarchies created between and across individuals who may be setting up schedules or who need to cope with waiting or delays. These hierarchies influenced the way participants perceived time, whether as more or less flexible or more or less purposeful. Importantly, the intervention enabled the families hosting them to make these issues explicit and approach time in a more questioning and complicated way.

Although each of the interventions carried out in the schools focused on exploring one of the principles of Temporal Design, they revealed how these principles are intrinsically interconnected and may presuppose each other. As seen in the responses to the Family Clock, the dominance of certain paradigms of time shift, and the focus away from the collective to the individual, lead people to treat time as a personal concern instead of a social construct.

Looking for alternative expressions of time will, therefore, point to a network of times, where activities, perceptions and natural rhythms intertwine to create a more complex timescape of the context in which we live. By exposing students to the variety of temporal expressions that are part of their contexts, these interventions allowed for a sense of temporal empathy to emerge. When they reflected on slow and fast moments, the students did not place value on their routines, but instead considered how time was expressed to them in their specific contexts.

As a social process, time is tacitly rehearsed, learned, designed, created, storied, and made. That time arises through these and other social practices is often overlooked not only by designers, but also by society in general. Designers can have a key role in unlocking the hegemonic narratives that restrict cultural understandings of time and in opening up new ways of making, living and thinking about time. Perhaps through design we will all be able to realise the multiplicity of phenomena that come together to define time, and feel more empowered to change attitudes and, like Sally C, “imagine what it would be like if you could change time.”

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